



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 8

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DATE: See date of Branch Manager signature

SUBJECT: CLEAN AIR ACT INSPECTION REPORT
Waste Management – Denver Arapahoe Disposal Site Landfill,
Aurora, CO

FROM: Katelyn Bergl, Environmental Engineer
Enforcement and Compliance Assurance Division,
Air and Toxics Enforcement Branch

THRU: Scott Patefield, Branch Manager
Enforcement and Compliance Assurance Division,
Air and Toxics Enforcement Branch

TO: File

BASIC INFORMATION

Facility Name: Denver Arapahoe Disposal Site (DADS) Landfill

Facility Location: 3500 Gun Club Road, Aurora, Colorado 80022

Date of Inspection: August 24, 2022

EPA Inspector(s):

1. Katelyn Bergl, Environmental Engineer
2. Sara Loiacono, Environmental Scientist

State Inspector(s):

1. Jeanna Beard, Environmental Protection Specialist – Colorado Department of Health and Environment (CDPHE), Air Pollution Control Division (APCD)
2. Alex Ehrman, CDPHE, APCD Inspector

Waste Management Attendees:

1. Kahner Cleveland, EP Specialist	7. Chad Hearn, Engineer
2. Brian Dodek, EP Manager	8. Martin Parra, GOS
3. Cheyenne Jurick, EP Specialist	9. Chris Anderson, Area Manager
4. David Thorley, Area Director	10. Matt Meyers, Western Regional Manager
5. Phil Spencer, Disposal Operations Manager Trainee	11. Andres Chacon, Gas Plant Operator
6. Trevor Surroca, Operation Manager	12. Eric DiEsposti, Gas Operations Manager

Contact Email Address: dthorley@wm.com; cander14@wm.com; bdodek@wm.com

Purpose of Inspection: To determine Clean Air Act (CAA) compliance and perform a comparative Surface Emissions Monitoring (SEM) survey

Facility Type: Municipal solid waste (MSW) landfill

Regulations Central to Inspection: 40 C.F.R. Part 60, Subpart Cf (formerly subject to 40 C.F.R. Part 60, Subpart WWW); 40 C.F.R. Part 63, Subpart AAAAA; Title V Permit Requirements of Operating Permit 99OPAR217

Arrival Time: 8:00 MDT

Departure Time: 15:30 MDT

Inspection Type:

- ☐ Unannounced Inspection
- ☒ Announced Inspection

OPENING CONFERENCE

- ☒ Presented Credentials
- ☒ Stated authority and purpose of inspection
- ☐ Provided Small Business Resource Information Sheet
- ☒ Small Business Resource Information Sheet not provided. Reason: Not a small business
- ☒ Provided CBI warning to facility

The following information was obtained verbally from Waste Management of Colorado, Inc. representatives or through review of facility records.

Process Description:

Denver Arapahoe Disposal Site Landfill (DADS) is a municipal solid waste (MSW) landfill located in Aurora, Colorado. DADS is owned by the City and County of Denver and operated by Waste Management Disposal Services of Colorado, Inc. (WMDSC). DADS is a lined RCRA Subtitle D site, having started operations in 1990. DADS accepts municipal solid waste, construction and demolition debris, contaminated soils, friable and nonfriable asbestos, and special wastes such as shredder fluff and fly or bottom ash. DADS accepts petroleum contaminated soils (PCS), which accounted for 1.2% of total waste disposed at DADS in 2020. The facility also recycles tires, household recyclables, appliances, e-waste, and scrap metal. Its design capacity is approximately 348 million cubic yards, with an expected closure date in 2150.

DADS receives approximately 8,000 tons of waste per day, a majority of which is MSW. Other wastes, such as construction and demolition waste, are comingled for disposal with MSW. The site is currently divided into three sections for MSW disposal: Section 31, Section 32, and Section 5. Section 31 has been under final cover since 2001 and is under active landfill gas (LFG) collection. Section 32 contains the current active fill area and is under intermediate cover with active LFG collection first installed in 2006. Section 5 is permitted for waste and has not yet been developed. DADS plans to expand into Section 5 in or around 2044, when Section 32 reaches capacity. DADS has a dedicated 26-acre monofill which is used exclusively for friable and non-friable asbestos; this monofill is excluded from LFG collection.

Condensate and leachate collected at DADS is recirculated or used for dust control in Subtitle D lined areas, sent to an on-site wastewater pre-treatment plant, or sent to an off-site wastewater treatment plant.

A gas collection and control system (GCCS) to collect and control LFG was first installed in Section 31 in 2001 and Section 32 in 2006. Currently, the leachate collection system is not connected to the GCCS. The GCCS consists of approximately 211 LFG extraction wells, consisting of primarily vertical extraction wells and a few horizontal collection wells. The LFG collection system spans all areas where waste has been disposed. During the process of refuse filling operations, vertical LFG gas extraction wells may be raised to prevent covering the well with new refuse. From 2012 through 2018, CDPHE approved various requests from DADS to increase future well spacing from 250-foot to 600-foot well spacing for specific areas of GCCS expansion installed in Section 32 after 2012. CDPHE, as part of their approval, requires DADS to monitor (the entire collection system) for and report methane readings between 200 and 500 ppm discovered during quarterly surface emission monitoring (SEM) events to verify adequacy of the increased well spacing.

DADS' GCCS control system consists of three control devices rated to accommodate a combined inlet LFG flow of up to 3,932 standard cubic feet per minute (scfm). The control devices include two open (candlestick) flares with capacities of 2,000 scfm and 600 scfm, and an on-site landfill gas-to-energy (LFGTE) plant with a rated maximum capacity of 1,332 scfm. The LFGTE consists of four reciprocating internal combustion Caterpillar 3516 engines with a rated maximum flow capacity of 333 scfm of LFG per engine. LFG generated by Section 32 is sent to the LFGTE plant due to its higher quality, while any excess LFG from Section 32 and all LFG from Section 31 and an adjacent facility's LFG are sent to the flares.

During the inspection, DADS personnel stated that the current LFG flow rate collected through the GCCS is approximately 2700 scfm. This includes approximately 200 scfm routed to the DADS control system from the adjacent Lowry Landfill Superfund Site, which is a closed landfill and is considered a separate facility but shares control devices with DADS. According to DADS' 2019 design plan, the combined modeled Sections 31 and 32 LFG generation rate for 2019 was estimated to be 5,062 scfm using EPA Landfill Gas Emissions modeling (LandGEM). DADS assumed a collection efficiency factor of 75% to project the maximum gas recovery rate for 2019 to be 3,796 scfm. The EPA Landfill LandGEM model yielded a peak LFG generation value of 10,379 scfm in 2044, currently projected to be the approximate final year of waste placement in Section 32. Section 5 projected peak LFG generation rate will be 18,769 scfm in 2151. DADS has stated the control devices will be upgraded or replaced as needed to control the LFG as flows increase in the future.

During CDPHE's review of DADS' May 17, 2021 *Revised Gas Collection and Control System Design Plan* (2021 GCCS Design Plan), CDPHE expressed concern that the control device capacity appeared to only provide a buffer of 136 scfm, according to 2019 gas generation estimations, when control devices are operated at 100% capacity. CDPHE requested clarification on DADS' process for verifying that control device capacity is sufficient for LFG production at the site. According to DADS' response, WMDSC performs an annual review of estimated gas generation and extraction versus actual gas production. Utilizing predictive models, control

device planning is continuously updated to ensure sufficient control device capacity is maintained for the gas collection system.

Surface Emission Monitoring:

According to DADS, the GCCS has been designed to minimize both subsurface lateral migration and surface emissions of LFG from the landfill. System performance depends upon the installation of a satisfactory GCCS system, proper management and installation, and maintenance of intermediate and suitable final refuse cover. Exceedances are addressed by evaluating both the GCCS and intermediate/final cover systems. In the past five years, exceedances have been addressed as required in all but one instance in March 2022. CDPHE issued a warning letter for failure to timely address the exceedance.

Verification of the GCCS' ability to minimize LFG migration is achieved through routine quarterly SEM monitoring as well as quarterly monitoring of gas probes around the perimeter of the landfill. Currently monitoring probes are installed around Section 31 and developed portions of Section 32. Monthly surface integrity cover monitoring is also performed to minimize LFG surface emissions. Due to increased well spacing of a number of wells in Section 32 of up to 600 feet between wells, DADS also records all methane readings between 200 and 500 ppm during SEM quarterly monitoring to verify adequacy of this well spacing design. Historic SEM methane exceedances above 500 ppmr are included in Table 1 below.

Table 1. DADS Historical SEM methane exceedance findings.

Monitoring Period	DADS Historical Methane Exceedances			
Quarter	Q1	Q2	Q3	Q4
2022	6	5	3	Not yet reported
2021	0	0	0	1
2020	0	0	*	0
2019	0	0	1	0
2018	*	*	*	0

* Data could not be located while reviewing records and does not indicate that monitoring was not performed during those quarters.

DADS personnel stated that SEM is conducted in all accessible areas including:

- Areas of active fill under interim cover, where waste has been in place for > 5 years,
- Areas that have waste in-place for more than 2 years and are closed or at final grade, or
- Areas where GCCS components have been installed.

Contractors for DADS do monitor penetrations during surface emissions monitoring. As stated in their 2021 GCCS Design Plan, SEM excludes areas with potentially dangerous conditions including "asbestos disposal areas, active areas including active waste disposal areas, vehicle and mobile equipment routes, and heavy equipment use areas". The 2021 GCCS Design Plan also mentions exclusion of steep slopes and other dangerous areas, as provided for in Per 40 CFR 60.753(d).

Approved Alternatives:

Through its design plan and historical correspondence with CDPHE and EPA, DADS has obtained several approvals for operating and monitoring practices which deviate from regulation or standard practice. Alternatives include increased LFG extraction well spacing, LFG extraction well

decommissioning procedures, and increased allowable oxygen concentration in LFG extraction wells connected to the leachate collection system. These alternatives are described briefly below.

Well Spacing

From 2012 through 2018, CDPHE approved various requests from DADS to increase future well spacing from 250-feet as required by regulation to 600-foot well spacing for specific areas of GCCS expansion installed in Section 32 after 2012. CDPHE, as part of their approval, requires DADS to monitor for and report methane readings between 200 and 500 ppm discovered during quarterly surface emission monitoring (SEM) events to verify adequacy of the increased well spacing.

Well Decommissioning

A decommissioned well is a well that is shut down for a period of time by fully closing the well valve or by disconnecting the well from the gas collection lateral. A decommissioned well is maintained for potential future use, differentiating it from an abandoned well which is not maintained for future use.

The following procedure will be used for decommissioned wells:

- a. The reason for well decommissioning will be noted in the NSPS semi-annual report;
- b. The decommissioned well will still be monitored monthly per NSPS requirements;
- c. Although the pressure may be positive for a decommissioned well, the temperature levels must continue to be monitored and meet NSPS requirements;
- d. The well may be temporarily opened during a monitoring event or left open only very slightly to relieve pressure buildup; and
- e. Quarterly surface monitoring will continue in the area of the well to make sure fugitive gas emissions are still below the 500-ppm compliance limit;

These procedures were approved as alternative operating scenarios as detailed in EPA clarification letters dated February 9, 2005 and February 12, 2003.

Oxygen Concentration

Currently, the leachate collection system is not connected to the GCCS, but may be connected in the future for various reasons. For GCCS connections to the leachate sidewall risers, oxygen concentrations up to 21 percent will be allowed at the wellhead, provided that the LFG temperature is maintained less than 55 degrees C (131°F). Additionally, gas collected from leachate risers may appear to be operated under positive pressure when the leachate pumps are operating, and therefore the gas collection of the leachate system should also be allowed to operate under positive pressure. This variance applies to wellheads that collect gas exclusively from the leachate system, and does not apply to LFG extraction wells/HGCs within the waste mass. This alternative is documented in a CDPHE variance approval letter, dated January 7, 2009.

TOUR INFORMATION

EPA Tour of the Facility: Yes

Data Collected and Observations:

EPA conducted a partial SEM survey of the facility. EPA used one ThermoFisher Toxic Vapor Analyzers 2020 (TVA2020) to perform EPA Reference Method 21 for the SEM. EPA offered Waste Management facility representatives the opportunity to visually confirm each exceedance

above 500 ppm measured on the TVA during the SEM survey.

EPA calibrated the TVA2020 before beginning the SEM survey, and conducted two drift checks after returning from lunch and at the conclusion of SEM survey. All readings were within 10% of the calibration gas.

The EPA SEM survey covered a small western portion of the landfill, estimated to represent approximately 15% of the landfill surface. EPA inspectors detected and documented 7 points on the landfill surface with concentrations of methane above 500 ppm. See Appendix B for more details. Some documented points involved multiple exceedances in close proximity, primarily at locations of surface erosion surrounding wellheads. Throughout the landfill, and particularly on the southern slope of the intermediate cover area, EPA observed recurring areas with little to no vegetation and erosion gullies.

During the inspection, EPA inspectors observed widespread surface erosion at the site consistent with heavy rain. DADS personnel stated that there were several unaddressed cover integrity issues at the site at the time of the inspection. The cause of the cover integrity issues as well as the delay in repairing the landfill cover was stated to have been recent abnormal rain events which were high in frequency and which produced a significant amount of precipitation in a short time period. There were several heavy rain events in the weeks prior to the inspection, consistent with statements made by DADS personnel.

CLOSING CONFERENCE

☒ Provided U.S. EPA point of contact to the facility

Compliance Assistance: None.

Photos and/or Videos: were taken during the inspection. See Appendix A

Field Measurements: were taken during this inspection. See Appendix B.

Records: were not taken during this inspection. Publicly available records were reviewed as part of the inspection.

Concerns:

EPA observed widespread cover integrity issues during the inspection which was also communicated to EPA inspectors by DADS personnel as an ongoing issue that they were aware of. DADS personnel described a delay in cover repair due to the extent and severity of recent rain events. DADS articulated a commitment to address the issue as quickly as possible.

Considering the small area of the landfill that was monitored during the inspection, EPA found a high rate of SEM methane readings above 500 ppm, distinctly above historic rates. The locations of the methane exceedances were communicated to DADS personnel during the closing conference as well as through email following the inspection. DADS committed to addressing the methane exceedances in the same way that is required for exceedances identified through quarterly SEM and followed up with EPA to confirm correction of the exceedance a return to appropriate methane levels at the surface.

No other concerns were noted.

DIGITAL SIGNATURES

Katelyn Bergl, Report Author

Scott Patefield, Manager

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APPENDICES AND ATTACHMENTS

Appendix A: Digital Image Log

Appendix B: Field Measurement Data, Including Maps

Facility Name: Waste Management Denver Arapahoe Disposal Site (DADS) Landfill
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APPENDIX A: DIGITAL IMAGE LOG

Photographer: Sara Loiacono			
Image #	File Name	Date/Time (Eastern)	Description of Image
1	DC_3066.jpg	2022-08-24 10:52	TVA Reading 3, Surface east of well GW-127; signs of erosion; no vegetation.
2	DC_3067.jpg	2022-08-24 10:55	TVA Reading 4, Surface north of well GW-127; signs of erosion; no vegetation.

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APPENDIX B: FIELD MEASUREMENT DATA

Measured Exceedances

#	Reading Time	Well / Location Description	Reading (PPM)	Latitude	Longitude	Observations
	10:44 AM	Southeast of active face of landfill	0.9 ppm	N 39.65359	W 104.70529	Downwind Background Reading
	10:58 AM	North northeast of active face of landfill	0.8 ppm	N 39.66696	W 104.69765	Upwind Background Reading
1	11:50 AM	Surface east of GW-127	1500 ppm	N 39.66039	W -104.68658	DC-3066.jpg
2	11:51 AM	Surface North of GW-127	3400 ppm	N 39.66043	W -104.68662	DC-3067.jpg
3	11:51 AM	Surface west of GW-127	900 ppm	N 39.66035	W -104.68678	
4	2:03 PM	HL-03 Leachate Riser penetration downslope from GW-91A	850 ppm	N 39.66574	W -104.67971	
5	2:54 PM	Upslope of GW-80 Extraction well penetration	12,600 ppm	N 39.66543	W -104.68352	
6	3:00 PM	Upslope of GW-84 at gas header pipe penetration	1028 ppm	N 39.66545	W -104.68295	
7	3:13 PM	GW-92 Extraction well penetration	10,070 ppm	N 39.66523	W -104.67998	

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Calibration and Instrument Information

EPA used one ThermoFisher Toxic Vapor Analyzer 2020 (TVA2020). The EPA TVA2020 response times are in the 4 to 5 second range.

- Katelyn Bergl and Sara Loiacono used the EPA TVA 2020 for the duration of the survey.
- Waste Management did not operate a TVA or similar instrument during the survey.
- Waste Management staff were shown readings on EPA instruments for visual confirmation of exceedances.

	TVA2020 Calibration Gas Readings		
Calibration/Drift Check Time	Zero ppm	500 ppm	10,000 ppm
10:00 calibration reading	1.2	501	1%
13:20 drift check reading	-0.8	489	957
15:45 end of day drift check	-1.1	485	948

Background readings:

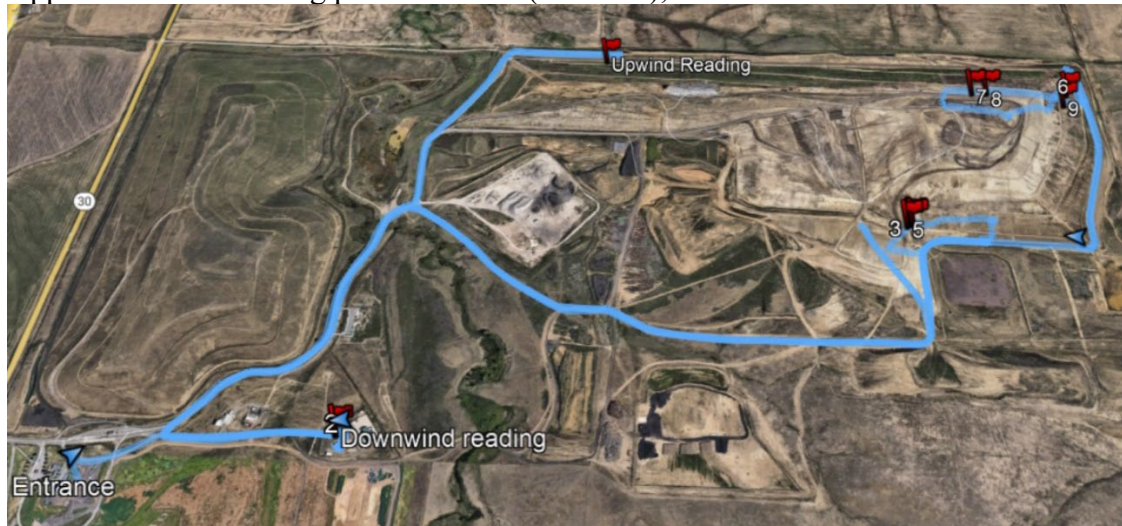
Upwind: 0.8 ppm

Downwind: 0.9 ppm

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Map of Detected Hits

SEM hit locations plotted over satellite imagery from June 7, 2015 as depicted on Google Earth. Approximate monitoring paths included (blue line), derived from GPS data.



Detail view on South East portion of landfill



Detail view on North East portion of landfill

